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AUTHOR D'Ccsta, Ayres G.
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Abstract

Understanding the world of work is contingent upon the availability of good occupational informaticn. Since the individual must interpret what he knows about himself in terms cf his understanding of the characteristics of the world of work, it is important that the world of work be described to him in terms that make this interpretaticn easy. Jobs must be defined in terms that make this interpretation easy. Jobs must be defined in terms cf wcrker characteristics. The Dictionary of Occupational Terms (1956) (DOT) was designed with this goal in mind. The Ohio Vocational Interest Survey (OVIS) has developed 24 interest scales, based on a cube mcdel of the basic wcrk dimensions; data, people, and things. The OVIS uses D.O.T. wcrker trait groups and recoded D.O.T. number levels. The 24 OVIS scales represent all of the 114 D.O.T. worker trait groups and therefore the world of work. The development, reliability, and validity, and the standardization of the OVIS is discussed. Although the OVIS scales dc not yet have the benefit of long term reliability and validity studies, it does appear that they are sound and promising. OVIS is adaptable to a computerized system of vocaticnal information based on the D.O.T., and can be readily used in a ccmputer-assisted system designed to teach decision-making and facilitate vocational exploration. (Author/KJ)

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THE DEVELOPMENT OF A VOCATIONAL INTEREST SURVEY USING THE DATA-PEOPLE-THINGS MODEL OF WORK

A paper delivered by Ayres G. D'Costa, Ph. D., at the American Personnel and Guidance Association at Las Vegas, Nevada, April 1969.

Self-fulfillment and Accommodation to Reality

Vocational Development theorists (Super, 1953; Ginzberg et. al. 1951) suggest that a career is formed through certain life stages that range from an early "fantasy" exploration of self, through a more realistic identity-seeking, to a final stage of stability and maturity. The self seeks its identity in stages (Erickson, 1963) and earlier stages are critical in the development of subsequent ones.

The process of growth also appears to be an interaction of what one can do and what one would like to do. Opportunity and ability interact with interests and values. Cooley (1967) found that Project TALENT youth appeared to become interested in what they did well, and to learn to do well what they liked to do. This kind of accommodation seems to be at the heart of vocational development. It is an individual-centered process that depends upon understandings of oneself and one's environment.

In a limited sense, guidance theorists have always had the above concepts in mind in their three-step formula: --understand yourself, understand the world of work, learn to make wise choices. Super et. al. (1963) added a new dimension to the process when he defined vocational development as the process by which an individual finds himself and his role in life. This process also accepts the principle of accommodation, a notion which is preferred in this paper over the earlier one of compromise.

Understanding the World of Work

Understanding the world of work is contingent upon the availability of good occupational information. Since the individual must interpret what he knows about himself in terms of his understanding of the characteristics of the world of work, it is important that the world of work be described to him in terms that make this interpretation easy. Jobs must be defined in terms of worker-characteristics rather than work-characteristics (McCormick, 1965).

The Third Edition of the Dictionary of Occupational Titles (1965) (D. O. T.) was designed with this goal in mind. The six-digit D. O. T. code classifies each job in person-related terms, specifying the activity

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performed and the psychological characteristics implied in it, in addition to major occupational or industrial labels. See Figure 1.

CATEGORY	DIVISION	GROUP		DATA	PEOPLE	THINGS
2	0	2	•	3	8	8

2 - CLERICAL AND SALES OCCUPATIONS
20 - STENOGRAPHY, TYPING, FILING AND RELATED
202 - SECRETARIES - TAKING AND TRANSCRIBING DICTATION

Figure 1. THE SIX-DIGIT D. O. T. CODE

The six-digit code--202. 388--for the job "stenographer" indicates: a) the activity performed by the worker and b) the job related personal characteristics that a typical worker has. The activity performed is specified by the three digits to the left of the decimal point in terms of general occupational CATEGORIES, which in turn are subdivided into DIVISIONS, which are further subdivided into GROUPS. Thus 202 indicates the group for secretaries--taking and transcribing dictation, who belong to the division for stenography, typing, filing and related work, which in turn belongs to the general category for clerical and sales occupations. The three digits to the right of the decimal point indicate the psychological implications of the job for the typical worker in terms of its level of involvement with data, with people, and with things. See TABLE I.

TABLE I. THE DATA, PEOPLE, THINGS LEVELS

DATA (4th digit)	PEOPLE (5th digit)	THINGS (6th digit)
0. Synthesizing	0. Mentoring	0. Setting-Up
1. Coordinating	1. Negotiating	1. Precision Working
2. Analyzing	2. Instructing	2. Operating-Controlling
3. Compiling	3. Supervising	3. Driving-Operating
4. Computing	4. Diverting	4. Manipulating
5. Copying	5. Persuading	5. Tending
6. Comparing	6. Speaking-Signaling	6. Feeding-Offbearing
7.) No significant	7. Serving	7. Handling
8.) relationship	8. No significant relationship	8. No significant relationship

The D. O. T. defines nine levels of complexity of involvement. Thus 388 indicates a Level 3 or "Compiling" for data, and Level 8 or "No significant relationship" for people and things.

The Data-People-Things Model

Occupational analysts of the U. S. Department of Labor (1967) identified data, people, and things as the basic elements of involvement in any job. The writings of E. L. Thorndike (1921) support this claim because he suggested that intelligence or human behavior can be classified as abstract, social, or mechanical. It is easy to note the relationship of abstract intelligence to the use of data or ideas in work, of social intelligence to one's adroitness in relating to people, and of mechanical intelligence to one's ability to manipulate things.

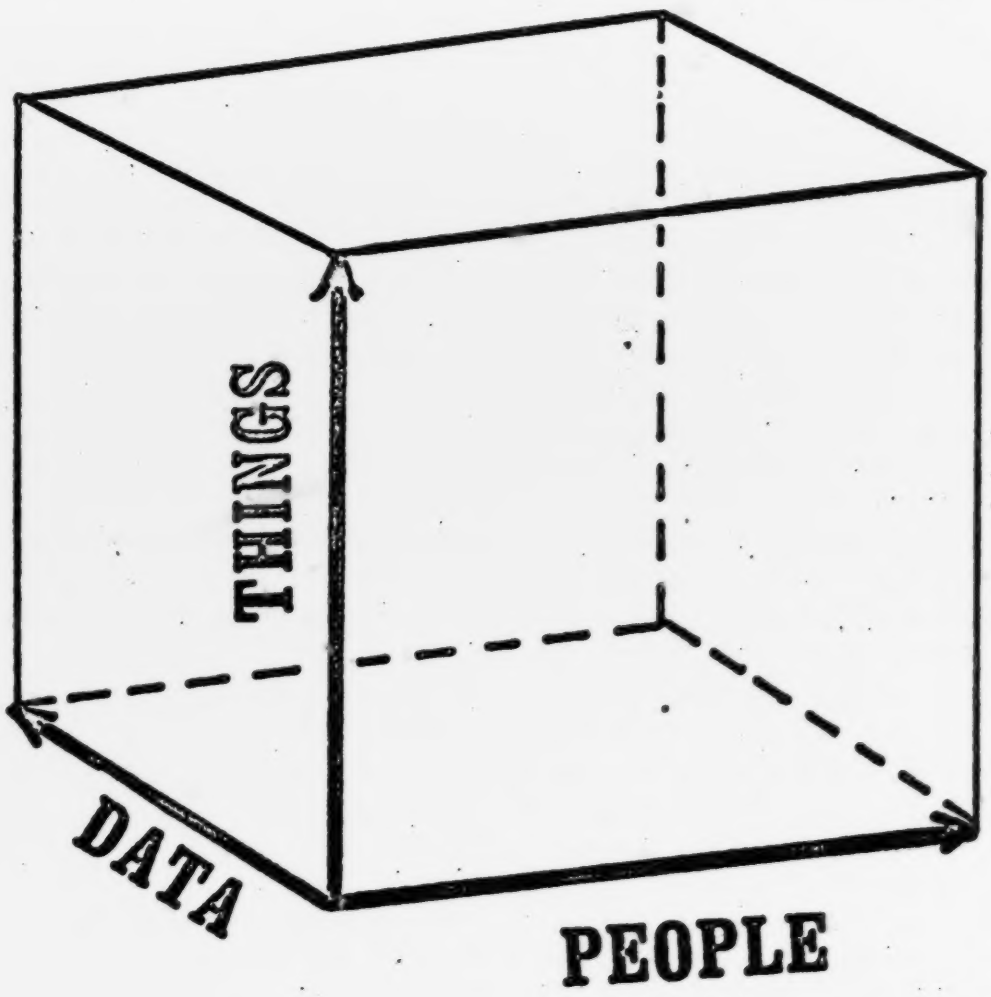

Figure 2. THE WORLD OF WORK IN A DATA-PEOPLE-THINGS SPACE

If data, people, and things are the basic dimensions of work, the world of work can be approximately represented by a three-dimensioned space or a cube (D'Costa and Winefordner, 1968). See Figure 2. Jobs which are described in terms of data, people, and things values can be plotted so as to occupy a unique spot in the cube. Since data, people, and things values have become available through the D. O. T. for all jobs,

TABLE II. THE OVIS INTEREST SCALES

*These ratings are explained by TABLE III.

1. **Manual Work** (001)*—Unskilled use of tools and routine work done by hand. Includes construction worker, farm hand, firefighter, dishwasher, janitor, and furniture mover.
2. **Machine Work** (002)—Operating and adjusting machines used in processing or manufacturing. Also includes driving tractor-trailer trucks and operating heavy equipment.
3. **Personal Services** (010)—Providing routine services for people as a waiter, waitress, household worker, doorman, messenger, gas station attendant, train conductor, policeman, fashion model, steward, or stewardess.
4. **Caring for People or Animals** (011)—Routine work related to the day-to-day needs of people or animals. Includes working in a nursing home, nursery, hospital, pet store, zoo, or animal laboratory.
5. **Clerical Work** (100)—Typing, recording, filing, and other clerical or stenographic work.
6. **Inspecting and Testing** (101)—Sorting, measuring, or checking products and materials; inspecting equipment or public facilities.
7. **Crafts and Precise Operations** (102)—Skilled use of tools or other equipment as in the building trades, machine installation and repair, or the operation of trains, planes, and ships. Includes carpenter, welder, tool and die maker, watch repairman, television technician, mechanic, and appliance repairman.
8. **Customer Services** (110)—Waiting on customers in stores, banks, motels, offices, or at home; helping telephone customers with business orders, reservations, and other information. Also include tour guides, bus drivers, and ticket and toll collectors.
9. **Nursing and Related Technical Services** (111)—Providing services as a nurse, physical therapist, X-ray or medical laboratory technician, or dental hygienist.
10. **Skilled Personal Services** (112)—Providing skilled services to people such as tailoring, cooking, barbering, or hairdressing.
11. **Training** (120)—Instructing people in employment or leisure-time activities such as games, crafts, flying, driving, and machine operation. Also includes training dogs, horses, and other animals.
12. **Literary** (200)—Writing novels, poetry, reviews, speeches, or technical reports; editing; translating.
13. **Numerical** (200)—Using mathematics as in accounting, finance, data processing, or statistics.
14. **Appraisal** (201)—Determining the efficiency of industrial plants and businesses, evaluating real estate, surveying land, and chemical or other laboratory testing.
15. **Agriculture** (202)—Farming, forestry, landscaping, and plant or animal research.
16. **Applied Technology** (202)—Applying engineering principles and scientific knowledge. Includes physics, chemistry, geology, architecture, and mechanical or other types of engineering.
17. **Promotion and Communication** (210)—Advertising, publicity, radio announcing, journalism, news information service, interviewing, recruiting; also providing legal services as a judge or lawyer.
18. **Management and Supervision** (210)—Administrative or supervisory work, such as shop foreman, supervisor, school administrator, police or fire chief, head librarian, executive, hotel manager, and union official. Includes owning or managing a store or business.
19. **Artistic** (212)—Interior decoration, display work, photography, commercial and creative art work, and artistic restoration.
20. **Sales Representative** (212)—Demonstrating and providing technical explanations of products or services to customers; selling products or services and providing related technical assistance. Includes department store buyer, factory sales representative, wholesaler, and insurance or real estate salesman.
21. **Music** (220)—Composing, arranging, conducting, singing, or playing instruments.
22. **Entertainment and Performing Arts** (220)—Entertaining others by participating in dramatics, dancing, comedy routines, or acrobatics.
23. **Teaching, Counseling, and Social Work** (220)—Providing instruction or other services in a school, college, church, clinic, or welfare agency. Includes instruction in art, music, ballet, or athletics.
24. **Medical** (222)—Providing dental, medical, surgical, or related services for the treatment of people or animals.

it is possible to plot all jobs in this cube. The task of representing the world of work in the cube can be simplified by plotting the 114 worker trait groups defined by the D. O. T. instead of the several thousand jobs. The D. O. T. suggests that these 114 worker trait groups are representative of the world of work and can be considered as reasonably homogeneous and unique.

Vocational Interest Scales

When the 114 worker trait groups were plotted in the data-people-things cube, they formed into clusters which, in turn, were found to be homogeneous not only in terms of their data, people, things values, but also in terms of other characteristics such as interests, temperaments, aptitudes, and general educational level. Since these clusters represent the 114 worker trait groups, they can be considered representative of the world of work and can therefore be used to define the domain of vocational interests. Each of the above clusters defines one or more interest scales for the Ohio Vocational Interest Survey (1968) (OVIS). Twenty-four interest scales have been defined for OVIS. These scales are listed and described in TABLE II.

It is useful to understand the relationships among the OVIS scales by comparing their respective data-people-things values. To facilitate this, OVIS combined the nine levels described by the D. O. T. for the data, people, things dimensions of work into three levels. See TABLE III.

TABLE III. OVIS-D. O. T. RELATIONSHIPS

Level of Involvement	OVIS Rating	D.O.T. Rating	DATA Functions	D.O.T. Rating	PEOPLE Functions	D.O.T. Rating	THINGS Functions
High	2	0 1 2	Synthesizing Coordinating Analyzing	0 1 2 3 4	Mentoring Negotiating Instructing Supervising Diverting	0 1 2 3	Setting-Up Precision Working Operating-Controlling Driving-Operating
Average	1	3 4 5 6	Compiling Computing Copying Comparing	6 7	Persuading Speaking-Signalling Serving	4 5 6 7	Manipulating Tending Feeding-Offbearing Handling
Low	0	7 8	No Significant Relationship	8	No Significant Relationship	8	No Significant Relationship

OVIS uses three levels--High, average, low--for each dimension and represents them by numbers 2, 1, 0 respectively. The combining of the D. O. T. original nine levels into three levels took into account the location of the clusters in the cube as well as the logical meaningfulness

of the new groups.

The cube is thus subdivided into a 3 x 3 x 3 matrix with 27 cells. See Figure 3. Each cell can be described in terms of its level of involvement with data, with people, and with things. See Figure 4. The numbers in brackets indicate the data, people, things level for each cell. The bold numbers indicate the number of the OVIS scale found in each cell.

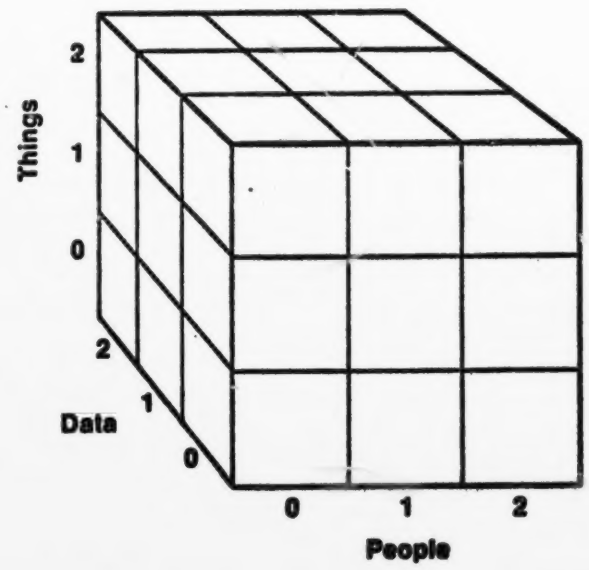

Figure 3. THE DATA-PEOPLE-THINGS DIMENSIONS OF THE WORLD OF WORK

The three-digit number in parenthesis identifies the OVIS Data-People-Things rating assigned to each cell.

The numbers below a three-digit number identify OVIS scales assigned to the cell in question.

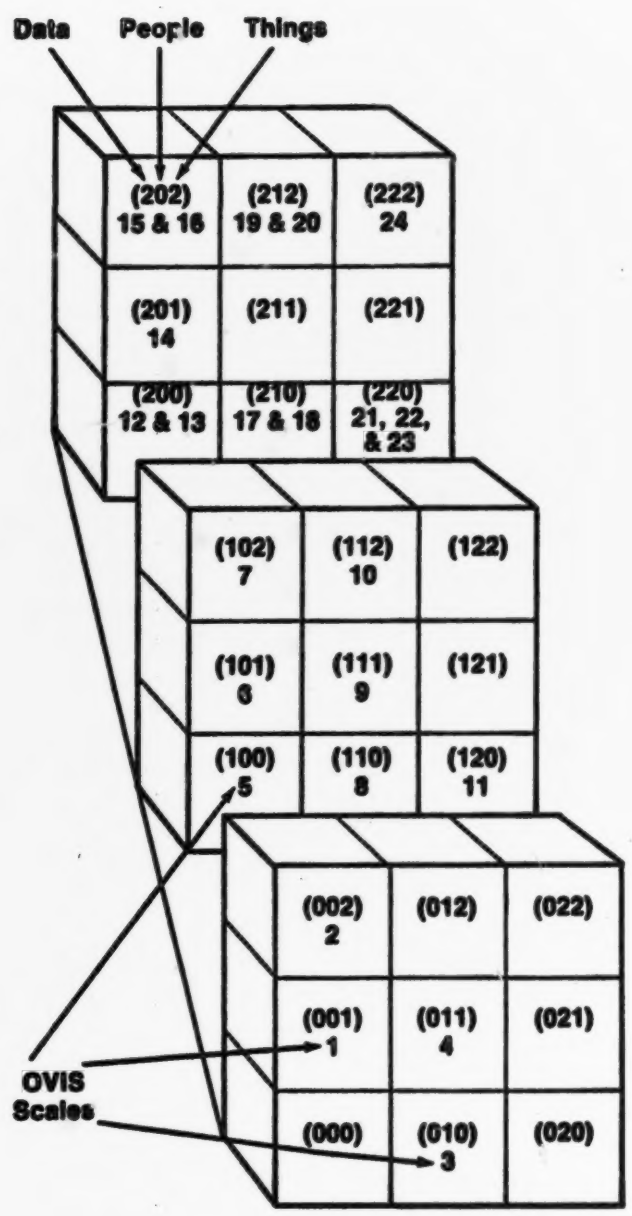

Figure 4. OVIS SCALES AND THE CUBISTIC MODEL OF VOCATIONAL INTERESTS

Cell (0, 0, 0) has low to no involvement with data, with people, and with things. When the worker trait groups were plotted in the cube, none of them was found in cell (0, 0, 0). Cell (0, 0, 1) has low to no involvement with data and with people, but has a 1 or average involvement with things. This cell had a cluster of jobs which appeared to be of the "manual" kind. Thus cell (0, 0, 1) is the location for OVIS Scale 1, Manual work. Similarly, cell (1, 0, 2) had 1 or average involvement with data, no involvement with people, and '2' or high involvement with things. This cell is the location for OVIS Scale 7, Crafts and Precise Operations.

Note that cells (0, 0, 0); (0, 2, 2); (0, 2, 1); etc. are not represented by any OVIS scales. This is because none of the worker trait groups in the D. O. T. is in these cells. In each case there appears to be a logical explanation for this phenomenon. Cell (0, 0, 0) for instance, is empty probably because useful work cannot be done without involving either data or people or things. Cell (0, 2, 2) is probably empty because it is inconceivable that high level work can be done with people and things without using data. Similar explanations might be given for the other empty cells.

It must be remembered that the lower data-level slab contains routine jobs because all its cells have little or no data involvement. The middle slab contains technican-type jobs because it has average data involvement. In general, the top slab contains professional jobs and has high data involvement. Note also that there is a relationship among OVIS Scales 1, 6, and 14. i.e., Manual work, Inspecting and Testing, and Appraisal. The people and things involvements are similar, but there is a progressive rise in data involvement. Similar relationships can be observed among Scales 12, 17, and 21, In this case the differences are due to the increasing involvement with people.

The Cubistic Model of Vocational Interests hypothesizes that the obtained clusters of worker trait groups are representative, though approximately, of the unknown clusters in the multidimensional space of the world of work. It is accepted that some of the obtained clusters may represent one or more of the unknown vocational clusters. Such a situation was noted particularly among the high data level clusters. e.g., Scales 15, 16; 21, 22, 23; etc. It was also noted that these clusters, although homogeneous in data, people, things terms, were somewhat heterogeneous in terms of job tasks thereby suggesting that some other factors appear to become significant as the data level or the job complexity increases. Several of the obtained clusters of worker trait groups were, therefore, subdivided on a logical basis. An OVIS scale was defined for each obtained cluster or subdivided cluster. The 24 OVIS scales represent all the 114 worker trait groups and therefore, the world of work. Each scale is also uniquely defined in terms of reasonably homogeneous work and worker characteristics.

The OVIS scales cannot be looked upon as mechanical clustering of worker trait groups on the basis of data, people, things. There are exceptional situations in which the worker trait groups did not fit in with the theoretical model. Such isolated worker trait groups were moved to adjacent cells where they appeared to belong instead of defining a new OVIS scale for each of such isolates. A few worker trait groups which were obvious misfits in their clusters were moved to adjacent clusters, or if their number warranted this, the cluster was split and two OVIS scales identified. Thus, work or task characteristics were also considered along with data, people, things values. It is believed that these exceptional situations are part of the empirical process of applying a theoretical cubistic model of vocational interests to an existing and practical system of occupational classification, like the D. O. T. The OVIS scales are therefore empirical and tentative. It is hoped that the accuracy with which they survey the world of work will improve as additional knowledge is gained of the world of work and the interest scales are refined.

Development of OVIS Items

OVIS items are brief statements of activities from typical jobs in the cluster of worker trait groups representing an OVIS scale. The items are Likert-type and are responded to individually on a five-point scale, ranging from "dislike very much" to "like very much." OVIS scales are, therefore, "a priori" scales in the sense that the items in them are based on logical grounds. However, they are also "homogeneous" scales in an empirical or statistical sense. Correlations were computed for each item with each of the 24 scale scores. The process of item development, which evolved through five experimental forms of OVIS, made sure that each item in a particular scale correlated better than 0. 55 with its own scale and correlated significantly higher with its own scale than the other 23 scales.

OVIS scales are not independent, but by selecting items that did not correlate as highly with other scales, considerable distinctness of scales has been obtained. The data, people, things relationships among the OVIS scales lead to some overlap which is noticeable in the inter-scale correlations. A good part of this interdependence can be attributed to halo or response set, or possibly, to a lack of vocational clarity or precision on the part of the respondents.

Reliability and Validity Studies

The studies reported so far were conducted on a developmental form of OVIS. Reliability, based on split-half correlation coefficients, averaged around 0. 9 after correction for length of scale. Test-retest coefficients averaged around 0. 8 with a waiting period of about 15 days.

The validity of OVIS scales is based on "a priori" as well as "empirical" foundations. The items in OVIS scales are valid to the

extent that the D. O. T. is valid in terms of its job descriptions and functional analyses. This is generally considered to be logical or content validity. An earlier version of OVIS was also subjected to a validation study (D'Costa, 1968) in which OVIS scores from a sample of some 350 "successful and satisfied" students enrolled in the six major vocational education areas were subjected to multiple discriminant analysis. It was found that the groups representing the six vocational education areas were significantly different in their OVIS scale scores and that discriminant functions derived from this study were significantly successful in classifying an independent sample of students. Furthermore, it was found that each vocational education group scored highest in those OVIS scales that might logically be expected to relate to the group. Thus the Agriculture group scored highest in the Agriculture scale, the Trades and Industrial group scored highest in the Crafts scale, etc.

Construct validity studies have been initiated. Canonical correlations will be computed between the Kuder Preference Record scales and OVIS scales, and between the SVIB Basic Scale and OVIS scales.

Standardization of OVIS

Norms were obtained for groups of students by sex on developmental versions of OVIS. Significant differences were noted for the sexes. For this reason, OVIS scales are scored for males and females. Most of the items are scored for both sexes, while some are scored only for one sex.

The Test Department of Harcourt, Brace and World, Inc. is conducting a nation-wide standardization of the final version of OVIS this spring (1969). Some 50,000 boys and girls in grades 8 through 12 from selected schools through the country have been administered OVIS. These schools were selected on the basis of their geographic location, their size, and community employment characteristics. The data obtained will provide reliability, validity, and normative information.

OVIS Reports and Their Use

OVIS includes a brief Student Information Questionnaire along with the inventory of job activities described above. This questionnaire draws the student's attention to his vocational planning concerns and returns a summary of his plans to him in his OVIS report. The school also receives a group summary of these plans. These facilitate curriculum development, indicate counseling needs, and provide general information on student plans.

The main report provided by OVIS is a profile of scores on the 24 scales. This includes a raw score, a percentile rank, and a stanine level for each scale. In addition, a scale clarity rating is given for each scale. This rating is related to the variability of a student's responses to items within a scale. The more variable his responses, the lower the scale clarity rating. The rating is reported as "highly

consistent," or "fairly consistent," or "inconsistent" on the basis of normative comparison.

The OVIS manual describes how a counselor might interpret OVIS reports to students. With some assistance, a student can use his OVIS report to obtain specific clues for vocational exploration using the list of typical jobs for each OVIS scale. The OVIS report attempts to bring together some of the major elements that a student needs to examine in order to devise realistic plans for vocational exploration and to make vocational decisions.

The Ohio Vocational Interest Survey is compatable with the philosophy of self-direction by students. Counselors are expected to be catalysts of change and development, rather than directors. It attempts to encourage vocational planning by providing realistic vocational exploration. It facilitates the use of the information resources of the Department of Labor. OVIS is adaptable to a computerized system of vocational information based on the D. O. T. and can readily be used in a computer-assisted system designed to teach decision-making and facilitate vocational exploration.

Conclusions

This paper has reported on the use of a data-people-things model of the world of work to define the domain of vocational interests and to demonstrate the validity of this approach in surveying vocational interests. Not only are interest scales obtained from the data-people-things model meaningful in terms of stable vocational interest dimensions, they are also practically useful since they lead directly to occupational exploration with the help of the D. O. T. system. There appears to be a meaningful transition from the basic elemental concepts of data, people, and things to the twenty-four areas defined by the OVIS scales, and from these twenty-four areas to more specific but related jobs as indicated in the D. O. T.

The data-people-things approach has been used by Project TALENT, specifically by Cooley and Lohnes (1968) in their Career Development Tree, when they classified their subjects' vocational choices into persons (people) versus non-persons (things), and into college (high data) versus non-college (low data). The data-people-things model, being three-dimensional, is much more realistic as a model of career development than the bipolar approach used by Cooley and Lohnes because it more easily allows interaction among the three dimensions. Subjects who start out as people-oriented, but later add the "things" dimension to this orientation, need not be thrown out as deviants. Instead, the three-dimensional model allows this kind of development as a possible one and predicts that such a person might aspire towards jobs represented by scales that have both the "people" and "things" elements, such as nursing, skilled personal service, medicine, and sales representative.

TABLE IV. COMPARISON OF OVIS AND SVIB SCALES

OVIS Scales		SVIB Basic Scales	
1.	Manual Work		
2.	Machine Work		
3.	Personal Services		
4.	Caring for People or Animals		
5.	Clerical Work	6.	Office Practices
6.	Inspecting and Testing		
7.	Crafts and Precise Operations	11.	Mechanical
8.	Customer Services	5.	Merchandising
9.	Nursing and Related Technical Services		
10.	Skilled Personal Service		
11.	Training	7.	Military Activities
		15.	Recreational Leadership
12.	Literary	22.	Writing
13.	Numerical	9.	Mathematics
14.	Appraisal	8.	Technical Supervision
15.	Agriculture	12.	Nature
		13.	Agriculture
16.	Applied Technology	10.	Science
17.	Promotion and Communication	1.	Public Speaking
		2.	Law/Politics
18.	Management and Supervision	3.	Business Management
19.	Artistic	21.	Art
20.	Sales Representative	4.	Sales
21.	Music	20.	Music
22.	Entertainment and Performing Arts	14.	Adventure
23.	Teaching, Counseling, and Social Work	17.	Social Service
		18.	Religious Activities
		19.	Teaching
24.	Medical	16.	Medical Service

Another recent development that brings in a different kind of credibility to the 24 OVIS scales are the 22 basic scales defined for the Strong's Vocational Interest Blank (SVIB) by Campbell, et. al. (1968). It is interesting to note that whereas Campbell started with the items in the SVIB pool, the basic scales he defined are very similar to those defined for OVIS on the basis of clusters obtained from the data-people-

things model. TABLE IV provides the two lists of scales for comparison. Note that the OVIS scales cover all jobs in the D. O. T. whereas the SVIB basic scales do not cover job clusters having low or no significant data involvement.

Campbell's research supports the validity and reliabity of these basic scales. Although the OVIS scales do not yet have the benefit of long-term reliability and validity studies, it does appear that they are sound and promising, thereby providing validity to the data-people-things approach in interest measurement.

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